

WHAT IS CLAIMED IS:

1. A rotary type hinge device for a portable wireless terminal, which is installed between a terminal body and a folder of the portable wireless terminal, the hinge device having a first rotation axis for opening and closing operations of the terminal body and
5 folder and a second rotation axis extending perpendicular to the first rotation axis, and being adapted to cause the folder to rotate about the second rotation axis in a state wherein the folder and terminal body are opened, the hinge device comprising:

a hinge housing rotatably coupled to the terminal body about the first rotation axis, the hinge housing being formed in a direction of the first rotation axis at a central
10 region of an inner peripheral surface thereof with a pair of support brackets protruding to face each other, the support brackets defining a circumferentially extended support groove at the inner peripheral surface therebetween, the hinge housing further being formed with a first opening for exposing the support brackets and support groove toward a direction of the second rotation axis;

15 a shaft frame unit formed with a fixing protrusion extended downwardly from a lower end thereof, which corresponds to the support groove, and at its inner surface around the lower end with a seating recess having a certain depth, the shaft frame unit defining a cam hole in the direction of the first rotation axis when the fixing protrusion is fixed into the support groove, the shaft frame unit further being formed at its upper end with a second
20 opening for exposing the seating recess toward the direction of the second rotation axis;

a main shaft unit rotatably positioned in the seating recess at its one end, and supported by the second opening at a certain position, the main shaft unit being formed with a shaft cam adapted to rotate about the second rotation axis within the cam hole of the shaft frame unit; and

25 a coil spring received in one side of the hinge housing and adapted to provide a certain elastic force to the shaft cam of the main shaft unit.

2. The rotary type hinge device as set forth in claim 1, wherein the shaft cam

comprises:

first and second flat surfaces formed on opposite sides thereof;

a first curved surface connecting respective one ends of the first and second flat surfaces to each other at a distance from the second rotation axis; and

5 a stopper connecting respective opposite ends of the first and second flat surfaces to each other at a farther distance from the second rotation axis than the first curved surface, and adapted to constrain a rotating range of the shaft cam.

3. The rotary type hinge device as set forth in claim 2, wherein the main shaft unit is stopped in rotation under a state wherein the first flat surface or second flat surface of
10 the shaft cam faces one end of the coil spring.

4. The rotary type hinge device as set forth in claim 2, wherein the stopper comes into contact with one side of the shaft frame unit to constrain the rotation of the shaft cam in a state wherein the first flat surface faces the coil spring, and also comes into contact with the coil spring to constrain the rotation of the shaft cam in a state wherein the second
15 flat surface faces the coil spring, whereby the shaft cam being adapted to rotate within a range of 180°.

5. The rotary type hinge device as set forth in claim 2, further comprising a washer plate between the shaft cam and the one end of the coil spring, which is adapted to come into slidable contact with the first curved surface during the rotation of the shaft cam.

20 6. The rotary type hinge device as set forth in claim 5, wherein the shaft cam is stopped in rotation under a state wherein the first flat surface or second flat surface of the shaft cam faces the washer plate.

7. The rotary type hinge device as set forth in claim 1, wherein:
each of the pair of support brackets is formed with a first fixing hole in the

direction of the first rotation axis, respectively, and the fixing protrusion of the shaft frame is formed with a second fixing hole encountering the first fixing holes; and the hinge device further comprises a frame holder having a fixing pin adapted to penetrate through the first and second fixing holes to be coupled therethrough, and a pair of support pins extended in parallel to the fixing pin and adapted to support the end of the main shaft unit located in the seating recess of the shaft frame unit and also adapted to support an inner surface around a lower end of the shaft frame unit, wherein the frame holder serves to firmly maintain a fixed state of the shaft frame unit between the support pins and fixing pin thereof.

10 8. The rotary type hinge device as set forth in claim 1, wherein:
the main shaft unit is protruded at the other end thereof out of the hinge housing through the second opening; and
the hinge device further comprises a holder to be fixed to one end of the folder, the holder being adapted to rotate about the second rotation axis while being coupled to the other end of the main shaft unit, the holder having fastening portions provided at respective
15 opposite ends of a pair of folder arms extended outwardly in opposite directions.

 9. The rotary type hinge device as set forth in claim 1, wherein:
the first opening of the hinge housing is extended further toward the one side of the hinge housing, thereby providing an assembly space of the coil spring; and
20 the hinge device further comprises a cover for supporting the main shaft unit, the cover being fixed to the first opening, thereby closing it and coming into close contact with an upper end surface of the shaft frame unit, the cover being formed with a third opening communicating with the second opening.

 10. A rotary type hinge device for a portable wireless terminal, which is installed
25 between a terminal body and a folder of the portable wireless terminal, the hinge device having a first rotation axis for opening and closing operations of the terminal body and

folder and a second rotation axis extending perpendicular to the first rotation axis, and being adapted to cause the folder to rotate about the second rotation axis in a state wherein the folder and terminal body are opened, the hinge device comprising:

5 a hinge housing rotatably coupled to the terminal body about the first rotation axis, the hinge housing being formed in a direction of the first rotation axis with a first opening, which extends from a central region of its outer peripheral surface to a side region adjacent to one end thereof and is adapted to expose a part of an inner peripheral surface thereof, the one end of the hinge housing constituting an opened end formed with a perforated hole;

10 a main shaft unit rotatably coupled into the inner peripheral surface at a central region in a longitudinal direction of the hinge housing through the first opening, the main shaft unit having a shaft cam adapted to rotate about the second rotation axis within the hinge housing;

15 a hinge shaft rotatably received relative to the first rotation axis within the hinge housing, the hinge shaft being formed at its one end with a hinge protuberance protruding outwardly through the perforated hole of the opened end so as to be fixed to the terminal body and at the other end thereof with a valley-shaped portion having a curved surface;

20 a hinge cam formed at its one end with a mountain-shaped portion coming into slidable contact with the valley-shaped portion and adapted to linearly reciprocate within the hinge housing in accordance with rotation of the hinge shaft; and

a coil spring interposed between the hinge cam and the shaft cam of the main shaft unit and adapted to provide an elastic force for causing the valley-shaped portion and mountain-shaped portion to come into close contact with each other and also to provide the certain elastic force to the shaft cam.

25 11. The rotary type hinge device as set forth in claim 10, wherein the shaft cam comprises:

first and second flat surfaces formed on opposite sides thereof;

a first curved surface connecting respective one ends of the first and second flat

surfaces to each other at a distance from the second rotation axis; and

a stopper connecting respective opposite ends of the first and second flat surfaces to each other at a farther distance from the second rotation axis than the curved surface, and adapted to constrain a rotating range of the shaft cam.

5 12. The rotary type hinge device as set forth in claim 11, wherein the shaft cam is stopped in rotation under a state wherein the first flat surface or second flat surface of the shaft cam faces the coil spring.

10 13. The rotary type hinge device as set forth in claim 11, further comprising a washer plate between the shaft cam and the one end of the coil spring, which is adapted to come into slidable contact with the first curved surface during the rotation of the shaft cam.

14. The rotary type hinge device as set forth in claim 13, wherein the shaft cam is stopped in rotation under a state wherein the first flat surface or second flat surface of the shaft cam faces the washer plate.

15 15. The rotary type hinge device as set forth in claim 10, wherein:
the hinge housing is formed in the direction of the first rotation axis at a center region of the inner peripheral surface thereof with a pair of support brackets protruding to face each other, the support brackets defining a circumferentially extended support groove at the inner peripheral surface therebetween, the support brackets and support groove being adapted to be exposed to the outside in a direction of the second rotation axis through the
20 first opening; and
the hinge device further comprises a shaft frame unit formed with a fixing protrusion extended downwardly from a lower end thereof, which corresponds to the support groove, and at its inner surface around the lower end with a seating recess having a certain depth, the shaft frame unit defining a cam hole in the direction of the first rotation axis when the
25 fixing protrusion is fixed into the support groove, the shaft frame unit further being formed

at its upper end with a second opening for exposing the seating recess toward the direction of the second rotation axis, wherein the main shaft unit is rotatably positioned in the seating recess at its one end and supported by the second opening at a certain position, and the shaft cam of the main shaft unit is adapted to rotate within the cam hole of the shaft frame unit.

16. The rotary type hinge device as set forth in claim 15, wherein:

each of the pair of support brackets is formed with a first fixing hole, and the fixing protrusion of the shaft frame is formed with a second fixing hole encountering the first fixing holes; and

the hinge device further comprises a frame holder having a fixing pin adapted to penetrate through the first and second fixing holes to be coupled therethrough, and a pair of support pins extended in parallel to the fixing pin and adapted to support the end of the main shaft unit located in the seating recess of the shaft frame unit and also adapted to support an inner surface around a lower end of the shaft frame unit, wherein the frame holder serves to firmly maintain a fixed state of the shaft frame unit between the support pins and fixing pin thereof.

17. The rotary type hinge device as set forth in claim 15, further comprising:

a cover for supporting the main shaft unit, the cover being fixed to the first opening, thereby closing it and coming into close contact with an upper end surface of the shaft frame unit, the cover being formed with a third opening communicating with the second opening.

18. The rotary type hinge device as set forth in claim 10, wherein:

the main shaft unit is protruded at the other end thereof out of the hinge housing through the second opening; and

the hinge device further comprises a holder to be fixed to one end of the folder, the holder being adapted to rotate about the second rotation axis while being coupled to the

other end of the main shaft unit, the holder having fastening portions provided at respective opposite ends of a pair of folder arms extended outwardly in opposite directions.

19. The rotary type hinge device as set forth in claim 18, wherein the portable wireless terminal further comprises a flexible printed circuit for electrical connection
5 between the terminal body and folder, the flexible printed circuit being wound at least one time around the main shaft unit between the holder and hinge housing.

20. The rotary type hinge device as set forth in claim 10, wherein the hinge housing is formed with at least one guide groove extended longitudinally at the inner peripheral surface thereof, and the hinge cam is formed at an outer peripheral surface
10 thereof with at least one guide protuberance corresponding to the guide groove, thereby guiding linear reciprocating movements of the hinge cam.

21. A method for operating a portable wireless terminal which comprises a rotary type hinge device for a portable wireless terminal, which is installed between a
15 terminal body and a folder of the portable wireless terminal, the method comprising:
opening and closing the terminal body and folder about a first rotation axis;
rotating the folder about a second rotation axis in a state wherein the folder and terminal body are opened, wherein the second rotation axis extends transverse to the first rotation axis.

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22. The method for operating a portable wireless terminal according to claim 21, further comprising:

rotating the folder about the first axis, causing the folder to be opened, wherein the folder includes a front main surface and a rear main surface;

25 rotating the folder about the second axis, causing a reversal of the front main surface with the rear main surface; and

rotating the reversed folder about the first axis, thereby fitting the folder into the

terminal body such that the portable wireless terminal can be used in a first mode.

23. The method for operating a portable wireless terminal according to claim 22, wherein the first mode comprises a PDA terminal mode.

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24. The method for operating a portable wireless terminal according to claim 22, further comprising:

a display device and camera lens, thereby providing motion picture services and video communications.

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25. The method for operating a portable wireless terminal according to claim 22, wherein the rotation of the folder about the first and second axis prevents damage to a flexible printed circuit providing electrical connection between the folder and terminal body.

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